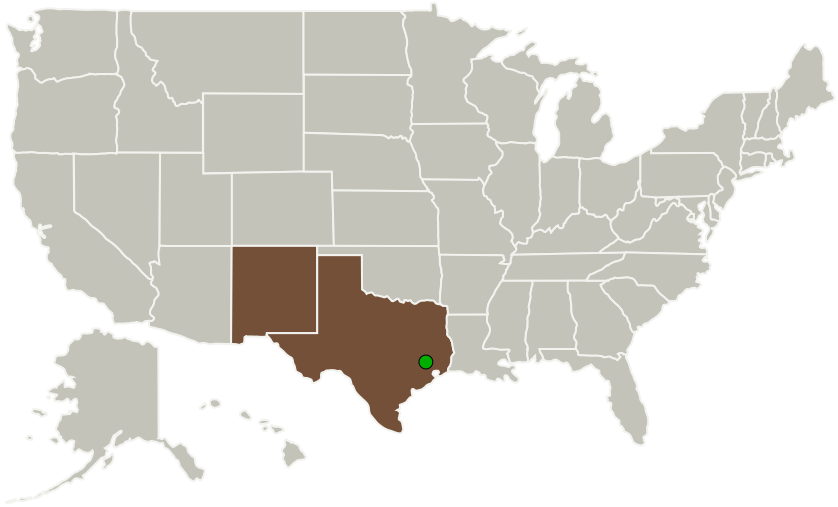
Advanced Spacecraft Thermal Modeling, Phase I

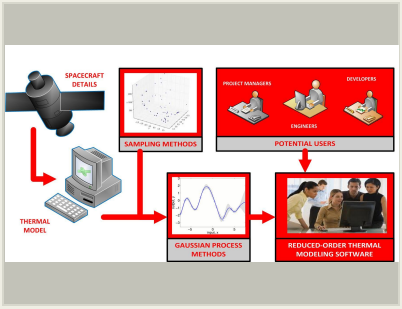
Completed Technology Project (2013 - 2013)

Project Introduction

For spacecraft developers who spend millions to billions of dollars per unit and require 3 to 7 years to deploy, the LoadPath reduced-order (RO) modeling thermal design tool is an innovative software tool that will significantly reduce labor costs and effort associated with the design and analysis of spacecraft thermal control systems. Unlike traditional approaches that take weeks to months to develop and obtain results, our approach can provide results in seconds to minutes. This proposed Phase I effort includes the development of a RO spacecraft thermal model utilizing a combination of a high-resolution thermal model, Latin Hypercube space-filling approaches, and Gaussian Process methods. Combined, these key components have the capability to provide a spacecraft thermal modeling software tool that provides thermal results, on average, within 3K of high-resolution models. In addition to its accuracy, the thermal software tool will be able to provide these results almost instantaneously. The ability to obtain results quickly is especially advantageous during design stages. In addition, it is especially useful for parametric studies. Parametric studies that could easily take days to complete, due to computational expense, can be completed within minutes utilizing the proposed software tool.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
LoadPath	Lead Organization	Industry	Albuquerque, New Mexico
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
New Mexico	Texas

Project Transitions

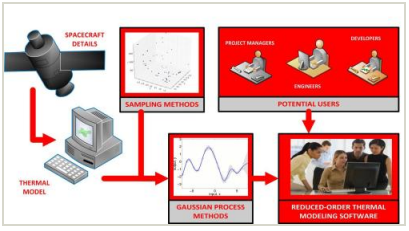
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140703)*

Images



Project Image
Advanced Spacecraft Thermal Modeling
(https://techport.nasa.gov/image/129559)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
LoadPath

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

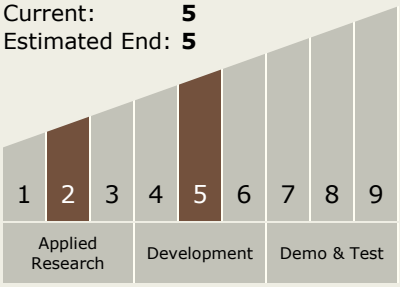
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Derek Hengeveld

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.5 Thermal Control Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System